

INTRODUCTION

The Mini Booster Neutrino Experiment (MiniBooNE) is designed to address the controversial oscillation signal seen by the Liquid Scintillator Neutrino Detector (LSND) experiment at Los Alamos. MiniBooNE will search for the appearance of electron neutrinos in a beam of muon neutrinos.

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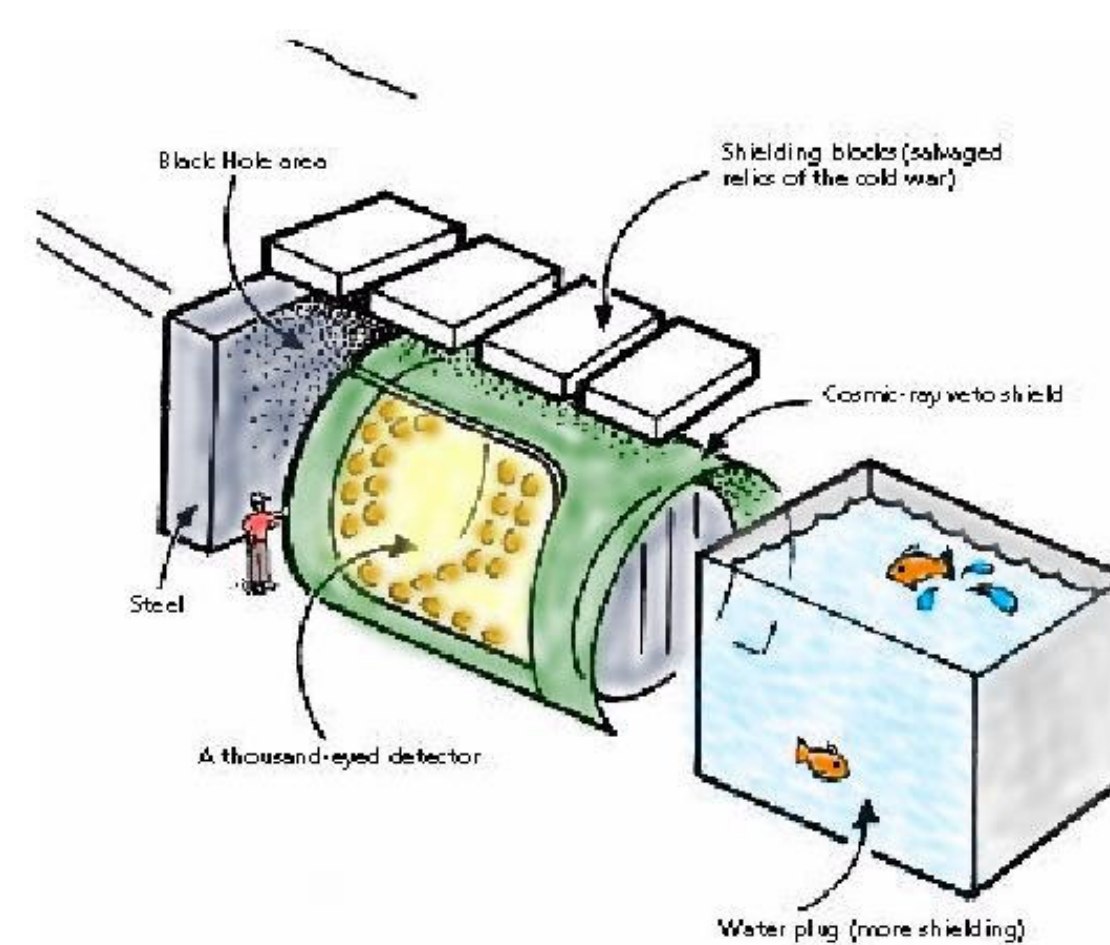
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MOTIVATION

LSND OVERVIEW



LSND was an accelerator-based $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ oscillation search at Los Alamos National Laboratory in New Mexico. An 800 MeV beam of protons was produced by LANSCE and directed to a water target, producing pions. These pions travelled to a copper beam stop where π^- were captured, and π^+ were brought to rest and decayed.

$$\pi^+ \rightarrow \mu^+ \nu_\mu$$

$$\searrow e^+ \nu_e \bar{\nu}_\mu$$

No $\bar{\nu}_e$ were produced in the decay chain; LSND searched for their appearance in a cylindrical detector filled with 167 tons of liquid scintillator and lined with 1220 photomultiplier tubes.

LSND RESULTS

The primary oscillation search at LSND used decay-at-rest (DAR) pions. An excess of $87.9 \pm 22.4 \pm 6.0$ $\bar{\nu}_e$ events were observed.

$$\pi^+ \rightarrow \mu^+ \nu_\mu$$

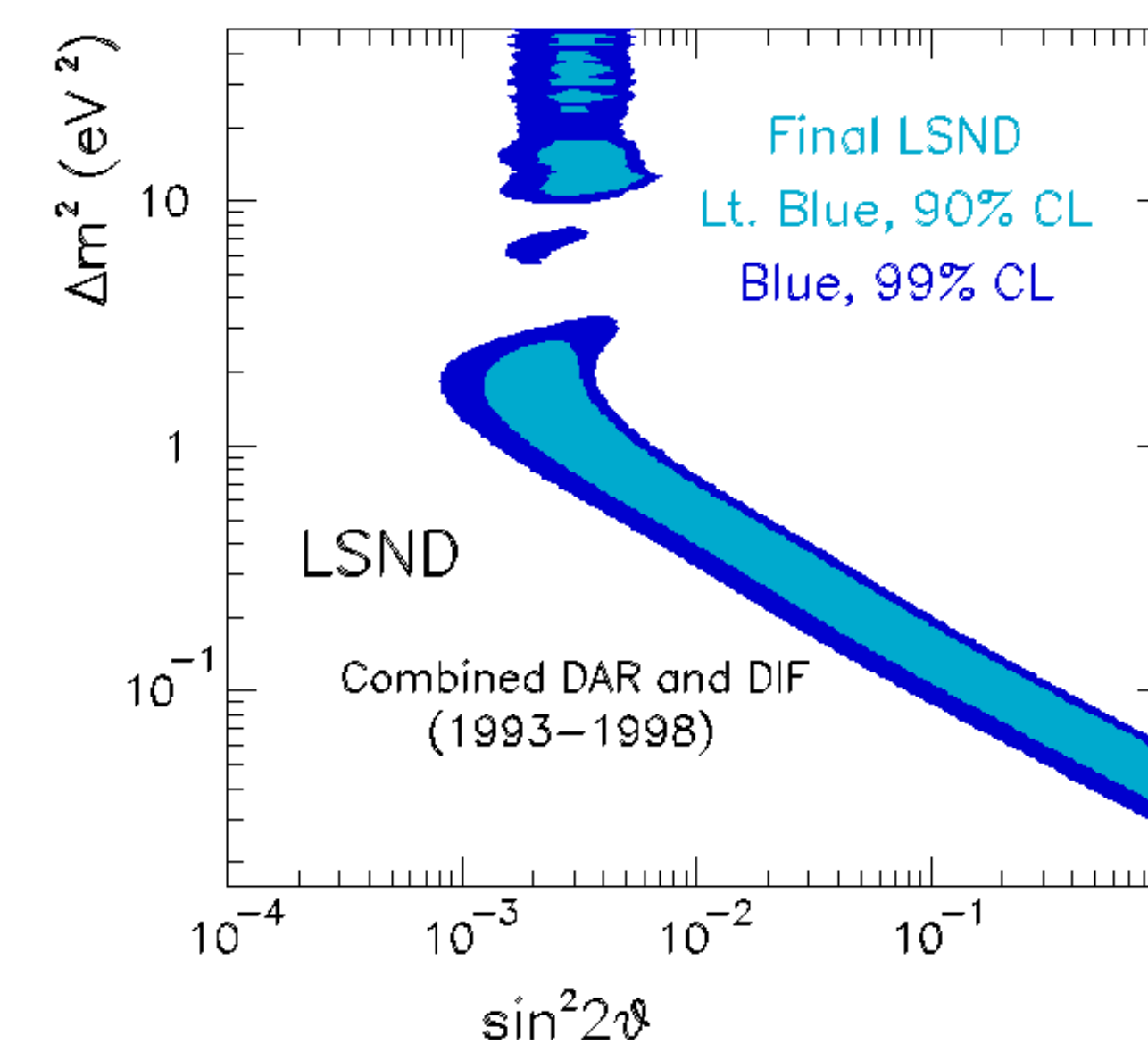
$$\searrow e^+ \nu_e \bar{\nu}_\mu$$

$$\downarrow \bar{\nu}_e$$

To strengthen the argument, a second complementary analysis was performed on decay-in-flight (DIF) pions. An excess of $18.1 \pm 6.6 \pm 4.0$ ν_e events were observed.

$$\pi^+ \rightarrow \mu^+ \nu_\mu$$

$$\downarrow \nu_e$$



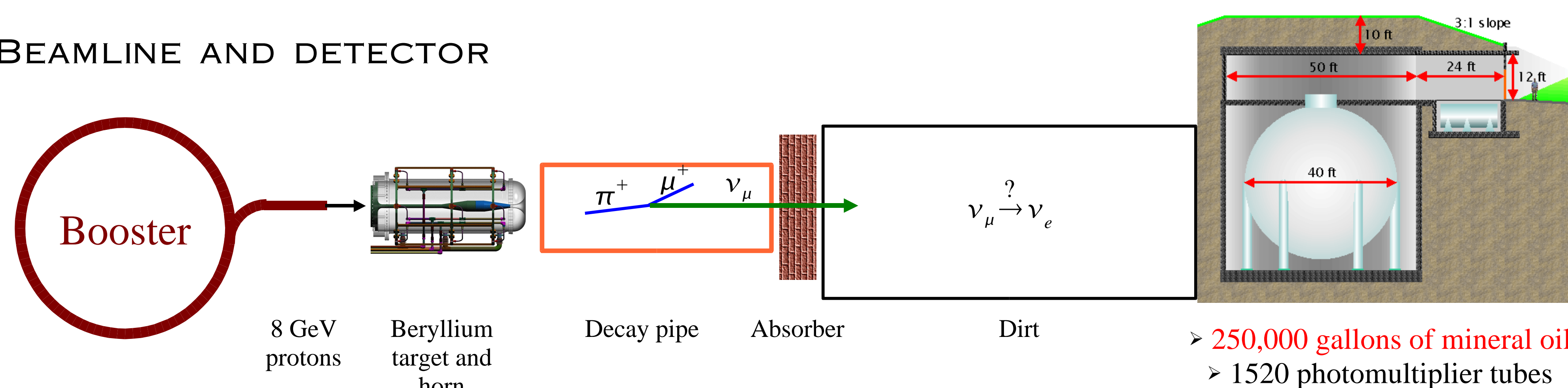
OSCILLATION PROBABILITY: $(0.264 \pm 0.067 \pm 0.045)\%$

SIGNAL HAS 3.6σ STATISTICAL SIGNIFICANCE.

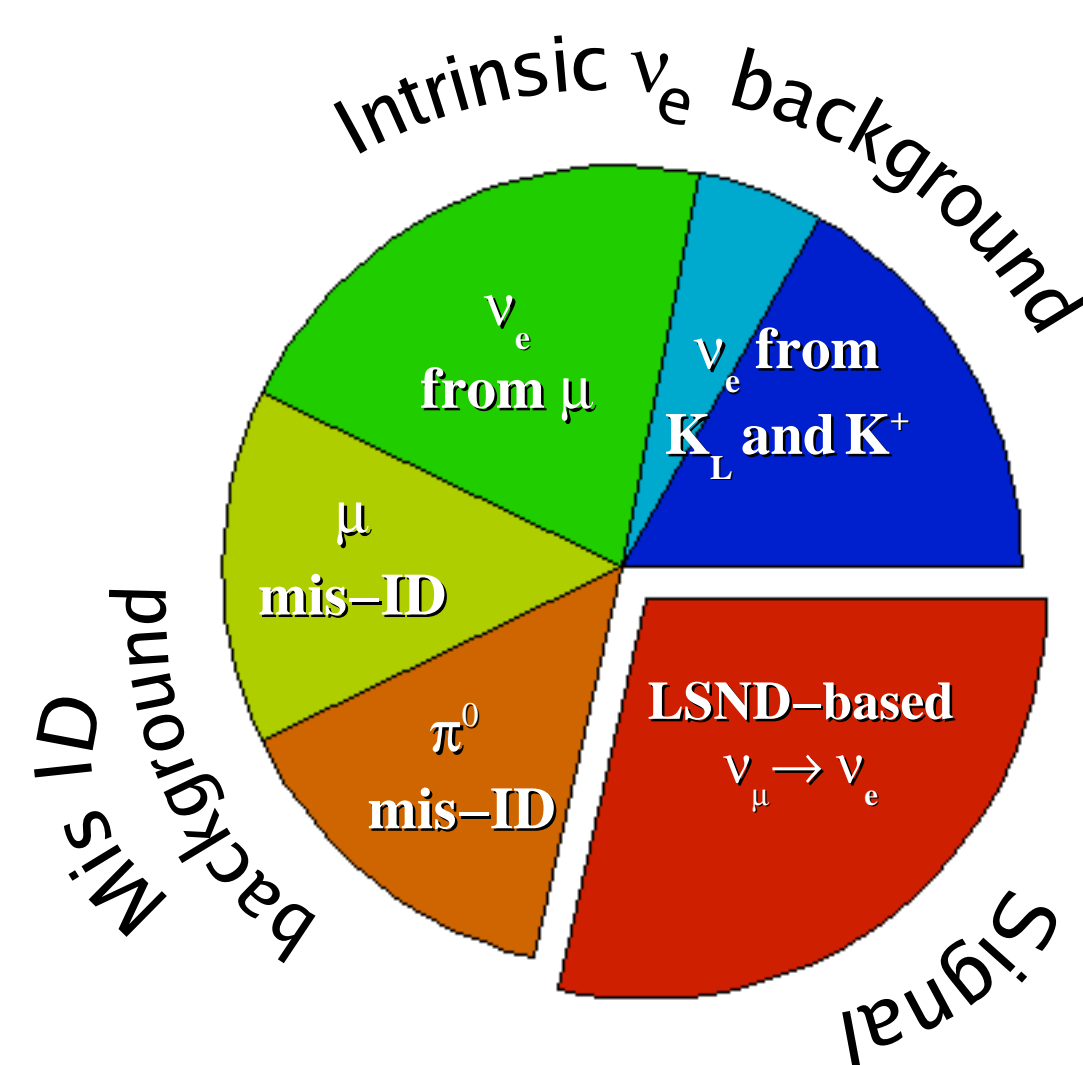
CONFIRMATION IS CRUCIAL!

MINIBOONE

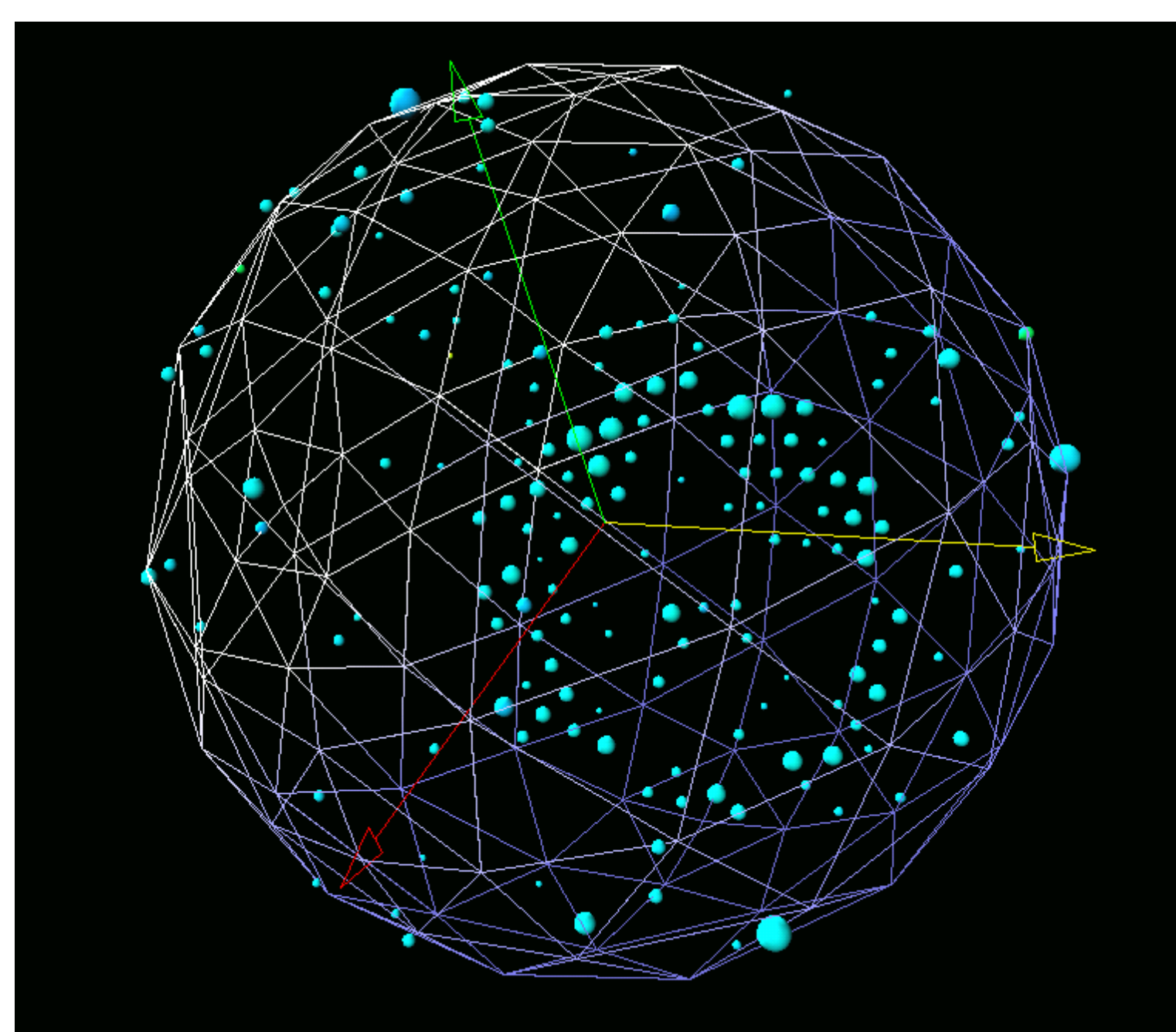
BEAMLINE AND DETECTOR



In two years of running MiniBooNE will see 10^{21} protons on target and record the following event types:



MINIBOONE'S FIRST COSMIC EVENT

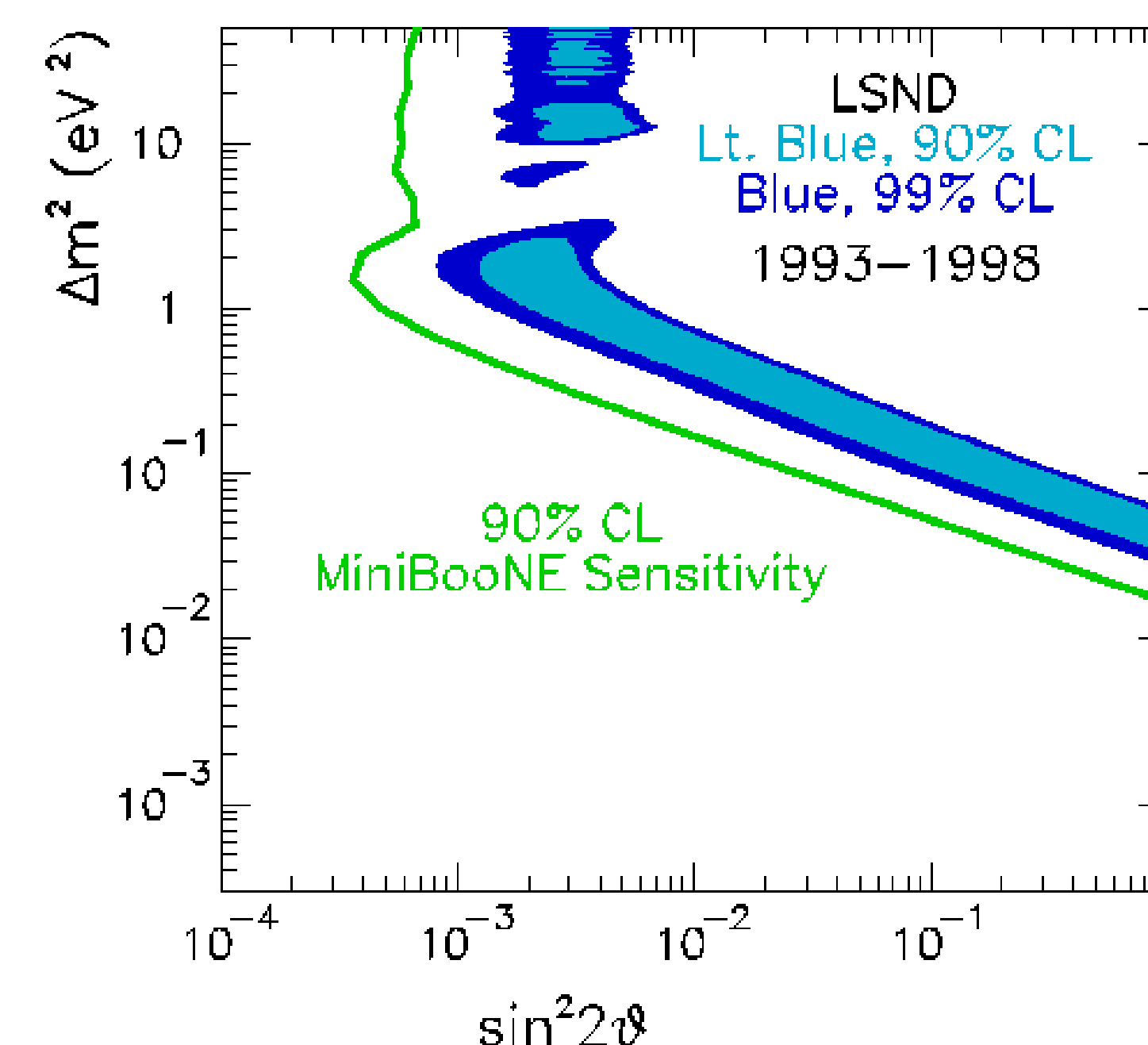


• MiniBooNE is the first stage of a two-stage experiment called BooNE (Booster Neutrino Experiment).

• MiniBooNE will search for oscillations in the LSND signal region in order to confirm or refute the signal observed by LSND.

• It will cover the LSND signal region at the 5σ level.

MINIBOONE SENSITIVITY



DIFFERENT KINEMATICS RESULT IN:

DIFFERENT BACKGROUNDS
DIFFERENT SYSTEMATICS
... SAME SIGNAL REGION!